

## **NEVC Notes on Ethanol Use In Small Engines**

All small engines and automotive engines produced in the past 15 years have been designed and manufactured to be able to operate on up to 10% ethanol. The Clean Air Act Amendments of 1990 required the addition of oxygen in motor gasoline to reduce exhaust emissions. The two primary forms of oxygen available in the early 90's was MTBE and ethanol. In the past 7 or 8 years, MTBE has been phased out of wide use as a result of the carcinogenic nature of the product. Ethanol is currently be used in all 50 states.

As ethanol makes its way into more and more fueling locations in the Southeast, it may be possible to see some operational difficulties in small engines. This is simply a result of the ethanol "cleaning" deposits of sludge, scale, and other contaminants that are found in underground storage tanks, fuel distribution systems, and fuel tanks on such engines. Generally speaking, all that is necessary is to clean the fuel filter and ensure that the user is able to purchase gasoline from a vendor that practices good maintenance procedures.

Please refer to the information below for manufacturers fuel recommendations for small engines and marine engines.

## 2003 POWER EQUIPMENT FUEL RECOMMENDATIONS

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### AGCO

- *500 Series Lawn Tractor*

#### OPERATION

##### Checks Before Starting

Fill the gasoline tank with fresh gasoline. Fill to bottom of filler neck to avoid spillage and overflow. DO NOT mix oil with gasoline. Refer to engine manual for gasoline recommendations.

#### NORMAL CARE

##### Checking and Adding Gasoline

Raise the hood and check the fuel tank to be sure there is enough gasoline to complete the job. To add gasoline, remove the gas cap. Do not overfill. Leave room in the tank for fuel expansion. Refer to your engine manual for gasoline recommendations. Install and hand tighten the gas cap.

#### CAUTION

Never use gasoline containing METHANOL, gasohol containing more than 10% ethanol, gasoline additives, premium gasoline, or white gas because engine/fuel system damage could result.

*[Note: See Briggs & Stratton, Honda or Kohler Engine Owner's Manual Depending on Which Engine is in AGCO model.]*

### FILLING FUEL TANK

**Important:** See engine manual for proper type and grade of fuel.

- *Imperial Rear Engine Rider Lawn Mower Models RM 1028, RM 1330, RM 1332*

### FILLING FUEL TANK

**Important:** DO NOT use gasohol or gasoline containing alcohol. Alcohol will cause internal parts to deteriorate. See Engine Manual for correct type and grade of fuel.

**NOTE:** For cold weather starts, use a winter grade gasoline which has a higher volatility to improve starting. DO NOT use gasoline left over from summer.

- *824 Deluxe Classic Snow-Thro Model 92450*

### FILL ENGINE FUEL TANK

Refer to Engine Manual for proper fuel type and tank capacity.

### FILLING FUEL TANK

**Important:** DO NOT use gasohol or gasoline containing alcohol. See Engine Manual for correct type and grade of fuel.

*[Note: See Briggs & Stratton or Tecumseh Engine Owner's Manual Depending on Which Engine is in Ariens model.]*

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### ARIENS

- *EZR Easy Turn Mower Models 915013, 915020, 915021, 915022, 915023, 915308*

#### PRESTART

##### 2. Check Fuel Level

Refer to Engine Manual for proper fuel.

- *Walk Behind Lawn Mower Models LM21, LM21S, LM21SE, LM21SW, LM21SC*

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### BILLY GOAT

- *Quiet Blow Blower Models QB554HC, QB654, QB884H, QB1004, QB1304H, QB1304HBW*

#### SAFETY INSTRUCTIONS

**DO** use fresh gasoline. Stale fuel can gum carburetor and cause leakage.

**Follow** engine manufacturer operating and maintenance instructions.

## 2003 Power Equipment Manufacturer Fuel Recommendations

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### STARTING ENGINE

See engine manufacturer's instructions for type and amount of oil and gasoline used. Engine must be level when checking and filling oil and gasoline.

*[Note: See Briggs & Stratton Engine Owner's Manual for Blower models QB654, QB1004. See Honda Engine Owner's Manual for Blower models QB554HC, QB884H, QB1304H, QB1304HBW.]*

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### COLEMAN

- *Powermate Pressure Washer*

### FUEL

Fill the tank with clean, fresh unleaded automotive gasoline. Regular grade gasoline may be used provided a high octane rating is obtained (at least 85 pump octane).

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### ECHO

- *GT-200R Grass Trimmer*

### SPECIFICATIONS

Gasoline	89 Octane unleaded. DO NOT use fuel containing methyl alcohol, more than 10% ethyl alcohol or 15% MTBE.
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### FUEL

#### Fuel Requirements

**Gasoline** - Use 89 Octane [R+M/2] (mid-grade or higher) gasoline known to be good quality. Gasoline may contain up to 15% MTBE (methyl tertiary-butyl ether). Gasohol containing methyl (wood) alcohol is **NOT** approved.

#### IMPORTANT

Stored fuel ages. Do not mix more fuel than you expect to use in thirty (30) days, ninety (90) days when a fuel stabilizer is added.

- *PB-210 Power Blower*

### SPECIFICATIONS

Gasoline	89 Octane unleaded. DO NOT use fuel containing methyl alcohol. Gasoline may contain 15% MTBE (methyl tertiary-butyl ether).
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### FUEL

#### Fuel Requirements

**Gasoline** - Use 89 Octane [R+M/2] (mid-grade or higher) gasoline known to be good quality. Gasoline may contain up to 15% MTBE (methyl tertiary-butyl ether). Gasoline containing methyl (wood) alcohol is **NOT** approved.

#### IMPORTANT

Stored fuel ages. Do not mix more fuel than you expect to use in thirty (30) days, ninety (90) days when a fuel stabilizer is added.

- *TC-2100 Tiller/Cultivator*

### SPECIFICATIONS

Gasoline	89 Octane unleaded. DO NOT use fuel containing methyl alcohol, more than 10% ethyl alcohol or 15% MTBE.
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**Gasoline** - Use 89 Octane [R+M/2] gasoline or gasohol known to be good quality. Gasohol may contain up to 10% Ethyl (grain) alcohol or 15% MTBE (methyl tertiary butyl ether). Gasoline containing methanol (wood alcohol) is **NOT** approved.

#### IMPORTANT

Stored fuel ages. Do not mix more fuel than you expect to use in thirty (30) days, ninety (90) days when a fuel stabilizer is added.

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### GENERAC POWER SYSTEMS

- *Portable Power Generator Models 4451, 4582*

### ADDING GASOLINE

Use regular UNLEADED gasoline with the generator engine. Do not use premium gasoline. Do not mix oil with gasoline.

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## 2003 Power Equipment Manufacturer Fuel Recommendations

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**IMPORTANT:** It is important to prevent gum deposits from forming in essential fuel system parts such as the carburetor, fuel hose or tank during storage. Alcohol-blended fuels (called gasohol, ethanol or methanol) can attract moisture which leads to separation and formation of acids during storage. Acidic gas can damage the fuel system of an engine while in storage. To avoid engine problems, the fuel system should be emptied before storage for 30 days or longer. See "STORAGE" on page 18. Drain the gas tank, start the engine and let it run until the fuel lines and carburetor are empty. Use fresh fuel next season. Never use engine or carburetor cleaner or carburetor cleaner products in the fuel tank as permanent damage may occur.

### LONG TERM STORAGE

It is important to prevent gum deposits from forming in essential fuel system parts such as the carburetor, fuel hose or tank during storage. Also, experience indicates that alcohol blended fuels (called gasohol, ethanol or methanol) can attract moisture which leads to separation and formation of acids during storage. Acidic gas can damage the fuel system of an engine while in storage.

To avoid engine problems, the fuel system should be emptied before storage of 30 days or longer.

Remove all gasoline from the fuel tank.

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## HOMELITE

- ***Ranger Chain Saw***

### FUELING

This product is powered by a 2-cycle engine and requires pre-mixing gasoline and 2cycle oil. Pre-mix unleaded gasoline and 2-cycle engine oil in a clean 1 gallon container approved for gasoline.

**RECOMMENDED FUEL:** THIS ENGINE IS CERTIFIED TO OPERATE ON UNLEADED GASOLINE INTENDED FOR AUTOMOTIVE USE.

- ***UT08110 Yard Broom***

### FUELING

This product is powered by a 2-cycle engine and requires pre-mixing gasoline and 2cycle oil. Pre-mix unleaded gasoline and 2-cycle engine oil in a clean 1 gallon container approved for gasoline.

**RECOMMENDED FUEL:** THIS ENGINE IS CERTIFIED TO OPERATE ON UNLEADED GASOLINE INTENDED FOR AUTOMOTIVE USE.

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## HONDA

- ***Rotary Lawn Mower***  
***Models HR215SXA, HR215HXA, HR215HMA***

### FUEL RECOMMENDATIONS

**Use unleaded gasoline with a pump octane rating of 86 or higher.**

This engine is certified to operate on unleaded gasoline. Unleaded gasoline produces fewer engine and spark plug deposits and extends exhaust system life.

Never use stale or contaminated gasoline or an oil/gasoline mixture. Avoid getting dirt or water in the fuel tank.

Occasionally you may hear light "spark knock" or "pinging" (metallic rapping noise) while operating under heavy loads. This is no cause for concern.

If spark knock or pinging occurs at a steady engine speed, under normal load, change brands of gasoline. If spark knock or pinging persists, see an authorized Honda servicing dealer.

### Oxygenated Fuels

Some conventional gasolines are being blended with alcohol or an ether compound. These gasolines are collectively referred to as oxygenated fuels. To meet clean air standards, some areas of the United States and Canada use oxygenated fuels to help reduce emissions.

## 2003 Power Equipment Manufacturer Fuel Recommendations

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If you use an oxygenated fuel, be sure it is unleaded and meets the minimum octane rating requirements.

Before using an oxygenated fuel, try to confirm the fuel's contents. Some states/provinces require this information to be posted on the pump.

The following are the EPA approved percentages of oxygenates.

**ETHANOL --** (ethyl or grain alcohol) 10% by volume

You may use gasoline containing up to 10% ethanol by volume. Gasoline containing ethanol may be marketed under the name "Gasohol".

**MTBE --** (Methyl Tertiary Butyl Ether) 15% by volume

You may use gasoline containing up to 15% MTBE by volume.

**METHANOL --** (methyl or wood alcohol) 5% by volume.

You may use gasoline containing up to 5% methanol by volume as long as it also contains cosolvents and corrosion inhibitors to protect the fuel system. Gasoline containing more than 5% methanol by volume may cause starting and/or performance problems. It may also damage metal, rubber, and plastic parts of your fuel system.

If you notice any undesirable operating symptoms, try another service station or switch to another brand of gasoline.

Fuel system damage or performance problems resulting from the use of an oxygenated fuel containing more than the percentages of oxygenates mentioned above are not covered under warranty.

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### HUSQVARNA

- *Ranger 55 Chain Saw*

#### FUEL HANDLING

##### Fuel Mix

**IMPORTANT:** The chain saw is equipped with a two-stroke engine and must always be using a mixture of gasoline and two-stroke engine oil. It is important to accurately measure the amount of oil to be mixed to ensure that the correct mixture is obtained. When mixing small amounts of fuel; even small inaccuracies can dramatically effect the ratios of the mixture.

##### Gasoline

- This engine is certified to operate on unleaded gasoline.
- Use good quality unleaded gasoline.
- The lowest recommended octane rating is 87. If you run the engine on lower octane rating than 87 so-called "knocking" can occur. This leads to an increased engine temperature, which can result in a serious engine breakdown.
- When working at continuous high revs a higher octane rating is recommended.

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### JOHN DEERE

- *Walk Behind Rotary Lawn Mower  
Models JA60, JA62*

#### SAFETY

Do not use methanol gasoline. Methanol is harmful to the environment and to your health.

#### OPERATING

##### Filling Fuel Tank

**IMPORTANT:** Avoid damage! Avoid spilling fuel. Fuel can damage plastic and painted surfaces.

Do not mix oil with gasoline. Unleaded gasoline with an octane rating of 87 or higher is recommended.

## 2003 Power Equipment Manufacturer Fuel Recommendations

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Fill tank with fresh fuel only to bottom of filler neck.

- **Walk-Behind Snowblowers**  
**Models 924DE, 1128DE, 1128DDE, 1332DDE**

### SAFETY

#### Handling Fuel Safely

DO NOT use METHANOL gasoline. METHANOL is harmful to the environment and to your health.

#### Filling Fuel Tank

Use regular grade 87 octane unleaded fuel.

Add John Deere fuel stabilizer to fuel before using it in your machine to prevent engine damage due to stale fuel. Follow directions on stabilizer container.

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## LAWN-BOY

- **GoldPro Series Walk Power Lawn Mower**  
**Models 10424, 10550, 10552**

### BEFORE STARTING

#### Mixing Gasoline and Oil

Your Lawn-Boy lawn mower is powered by a two-cycle engine which requires 32:1 mixture of gasoline and oil.

Use only clean, fresh, lead-free gasoline (including oxygenated or reformulated gasoline) with an octane rating of 87 or higher. To ensure freshness, purchase only the amount of gasoline you expect to use in 30 days. Using unleaded gasoline results in fewer combustion chamber deposits and longer spark plug life.

**Important: Do not use methanol, gasoline containing methanol, gasoline containing more than 10% ethanol, premium gasoline, or white gas. Using these fuels can damage the engine's fuel system.**

**Important: Do not use fuel additives except a fuel stabilizer during storage. Do not use fuel stabilizers with an alcohol base such as ethanol, methanol or isopropanol. You**

**do not need a stabilizer if you use *Lawn-Boy Generation II 2-cycle oil*.**

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## MANTIS

- **Mantis Tiller Model 7222**

### MIXING FUEL

Your Mantis Tiller is powered by a commercial two stroke, air cooled engine which requires a fuel mixture of gasoline and lubricating oil.

Use a mixture of 50 parts unleaded regular gasoline and 1 part two-stroke Mantis oil (50:1). Use branded 89 octane (R+M+2) unleaded gasoline or gasohol (maximum 10% ethyl alcohol, or 15% MTBE, no methyl alcohol).

**IMPORTANT:** Two stroke fuel separates and ages. Do not mix more than you will use in a month. Using old fuel can cause difficult starting or engine damage. Shake fuel container to thoroughly mix fuel before each use. Do not attempt to run your engine on gasoline only, use proper fuel mixture.

### IMPORTANT NOTE

**Do Not use old or stale oil/gasoline mixture. Always use the proper oil/gasoline mixture. If you do not, your engine will suffer rapid permanent damage. And you will void the engine warranty.**

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## MASSEY FERGUSON

- **2500 Series Lawn Tractor**

### OPERATION

#### Checks Before Starting

Fill the gasoline tank with fresh gasoline. Fill to bottom of filler neck to avoid spillage and overflow. DO NOT mix oil with gasoline. Refer to engine manual for gasoline recommendations.

## 2003 Power Equipment Manufacturer Fuel Recommendations

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### NORMAL CARE

#### Checking and Adding Gasoline

Raise the hood and check the fuel tank to be sure there is enough gasoline to complete the job. To add gasoline, remove the gas cap. Do not overfill. Leave room in the tank for fuel expansion. Refer to your engine manual for gasoline recommendations. Install and hand tighten the gas cap.

#### CAUTION

Never use gasoline containing METHANOL, gasohol containing more than 10% ethanol, gasoline additives, premium gasoline, or white gas because engine/fuel system damage could result.

*[Note: See Briggs & Stratton, Honda or Kohler Owner's Manual Depending on Massey Ferguson model.]*

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### MURRAY

- **Lawn Tractor**  
**Model 46104x8D**

#### HOW TO PREPARE THE ENGINE

**WARNING:** Follow the engine manufacturer's instructions for the type of gasoline and oil to use.

#### OPERATION

##### Add Gasoline

Fill the fuel tank with regular unleaded gasoline. Do not use premium unleaded gasoline. Make sure the gasoline is fresh and clean. Leaded gasoline will increase deposits and shorten the life of the valves.

**CAUTION:** A mixture of alcohol (ethanol or methanol) and gasoline (called gasohol) will attract moisture and cause acid deposits during storage. While the unit is in storage, the acids in the fuel can damage the fuel system.

To prevent engine problems with the fuel system, empty the fuel system before storage of 90 days or longer as follows:

1. Drain the fuel tank.
2. Start the engine. Let the engine run until the fuel lines and carburetor are empty.

3. After storage, make sure you use fresh fuel. See the storage section for addition information.

4. Never use engine or carburetor cleaner or carburetor cleaner in the fuel tank or permanent damage can occur.

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### POULAN

(Division of Electrolux Home Products)

- **Chain Saw**  
**Models 2750, 2775, 2900, 3050**

#### FUELING & LUBRICATION

##### Fueling Engine

This engine is certified to operate on unleaded gasoline. Before operation, gasoline must be mixed with a good quality synthetic 2-cycle air-cooled engine oil designed to be mixed at a ratio of 40:1. Poulan/Weed Eater brand synthetic oil is recommended. Mix gasoline and oil at a ratio of 40:1. A 40:1 ratio is obtained by mixing 3.2 ounces of oil with 1 gallon of unleaded gasoline. When mixing fuel follow the instructions printed on the container. Always read and follow the safety rules related to fuel before fueling your unit.

**IMPORTANT:** Experience indicates that alcohol blended fuels (called gasohol or using ethanol or methanol) can attract moisture which leads to fuel mixture separation and formation of acids during storage. Acidic gas can damage the fuel system of an engine while in storage. To avoid engine problems, the fuel system should be emptied before storage for 30 days or longer. Drain the gas tank, start the engine and let it run until the fuel lines and carburetor are empty. Use fresh fuel next season. See STORAGE section for addition information.

#### STORAGE

**CAUTION:** It is important to prevent gum deposits from forming in essential fuel system parts such as the carburetor, fuel filter, fuel hose or fuel tank during storage. Alcohol blended fuels (called gasohol or using ethanol or methanol) can attract moisture which leads to fuel mixture separation and formation of acids during storage. Acidic gas can damage the engine.



## 2003 Power Equipment Manufacturer Fuel Recommendations

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### SEARS

- **Craftsman Tiller**  
**Model 917.293480**

#### OPERATION

##### Add Gasoline

- Fill fuel. Use fresh, clean, regular unleaded gasoline. (Use of leaded gasoline will increase carbon and lead oxide deposits and reduce valve life.)

**IMPORTANT:** When operating temperatures below 32°F (0°C), use fresh, clean, winter grade gasoline to help insure good cold weather starting.

Recommended. Mix gasoline and oil at a ratio of 40:1. A 40:1 ratio is obtained by mixing 3.2 ounces of oil with 1 gallon of unleaded gasoline. When mixing fuel follow the instructions printed on the container. Always read and follow the safety rules related to fuel before fueling your unit.

**WARNING:** Experience indicates that alcohol blended fuels (called gasohol or using ethanol or methanol) can attract moisture which leads to fuel mixture separation and formation of acids during storage. Acidic gas can damage the fuel system of an engine while in storage. **To avoid engine problems, the fuel system should be emptied before storage for 30 days or longer.** Drain the gas tank, start the engine and let it run until the fuel lines and carburetor are empty. **Use fresh fuel next season.** See STORAGE section of this manual for addition information. Never use engine or carburetor cleaner products in the fuel tank or permanent damage may occur.

#### STORAGE

##### ENGINE FUEL SYSTEM

**IMPORTANT:** It is important to prevent gum deposits from forming in essential fuel system parts such as the carburetor, fuel filter, fuel hose or tank during storage. Also, experience indicates that alcohol blended fuels (called gasohol or using ethanol or methanol) can attract moisture which leads to separation and formation of acids during storage. Acidic gas

can damage the fuel system of an engine while in storage.

1. Drain the gas tank,
2. Start the engine and let it run until the fuel lines and carburetor are empty. See STORAGE section for addition information

- Never use engine or carburetor cleaner products in the fuel tank or permanent damage may occur.
- Use fresh fuel next season.

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### SIMPLICITY

- **Regent Lawn Tractor**

#### OPERATION

##### Checks Before Starting

Fill the gasoline tank with fresh gasoline. Fill to bottom of filler neck to avoid spillage and overflow. **DO NOT** mix oil with gasoline. Refer to engine manual for gasoline recommendations.

#### NORMAL CARE

##### Checking and Adding Gasoline

Raise the hood and check the fuel tank to be sure there is enough gasoline to complete the job. To add gasoline, remove the gas cap. Do not overfill. Leave room in the tank for fuel expansion. Refer to your engine manual for gasoline recommendations. Install and hand tighten the gas cap.

#### CAUTION

Never use gasoline containing **METHANOL**, gasohol containing more than 10% ethanol, gasoline additives, premium gasoline, or white gas because engine/fuel system damage could result.

*[Note: See Briggs & Stratton, Honda or Kohler Engine Owner's Manual Depending on Which Engine is in Simplicity model.]*



## 2003 Power Equipment Manufacturer Fuel Recommendations

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### SNAPPER

- **Series 20 Rear Engine Riding Mower Models 281320BE, 301320BE, 3314520BVE, 331520KVE**

#### Section 2 - OPERATING INSTRUCTIONS

##### 2.1 Pre-Start Check List

Make the following checks and perform the service required before each start-up.

- 2.1.8. Add fuel to tank after pushing the Rear Engine Rider outside where fumes can dissipate. Make sure fuel filler cap is tight and vent is open after refueling. Refer to engine owner's manual for fuel specifications.

**[Note: See Briggs & Stratton or Kohler Engine Owner's Manual Depending on Which Engine is in Snapper model.]**

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### TORO

- **Super Recycler Walk Power Lawn Mower Model 20033**

#### FILLING THE FUEL TANK WITH GASOLINE

For best results, use clean, fresh, lead-free gasoline with an octane rating of 87 or higher. To ensure freshness, purchase only the quantity of gasoline you expect to use in 30 days. Unleaded gasoline burns cleaner, extends engine life, and promotes good starting. You may use leaded gasoline if unleaded gasoline is unavailable.

**Important:** Do not add oil to the gasoline.

**Important:** Do not use methanol, gasoline containing methanol, gasohol containing more than 10% ethanol, premium gasoline, or white gas. Using these fuels can damage the engine's fuel system.

**Important:** Do not use gasoline that is more than 30 days old.

Use a fuel stabilizer/conditioner regularly during operation and storage. A stabilizer/conditioner cleans the engine during operation and prevents gum-like varnish deposits from forming in the engine during periods of storage.

**Important:** Do not use fuel additives other than a fuel stabilizer/conditioner. Do not use fuel stabilizers with an alcohol base such as ethanol, methanol or isopropanol.

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### TROY-BILT

- **Tuffy, Bronco & Super Bronco Tillers**

#### ENGINE INFORMATION

The engine manufacturer is responsible for all engine-related issues with regards to performance, power-rating, specifications, warranty and service. Please refer to the engine manufacturer's Owner's/Operator's Manual packed separately with your unit for more information.

#### STARTING AND STOPPING THE ENGINE

##### Pre-Start Check List

With the spark plug wire disconnected from the spark plug, perform the following checks and services before each use.

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7. Fill the fuel tank with gasoline according to the directions in the separate Engine Owner's Manual. Follow all instructions and safety rules carefully.

**[Note: See Briggs & Stratton Engine Owner's Manual Engine.]**

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### Power Engine Manufacturers

#### BRIGGS & STRATTON

- **Models 110000, 120000, 200000, 210000**

#### FUEL TYPE OF FUEL TO USE

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## 2003 Power Equipment Manufacturer Fuel Recommendations

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- Use clean, fresh, regular unleaded gasoline with a minimum of 85 octane. Fresh fuel prevents gum from forming in the fuel system or on essential carburetor parts. Purchase fuel in quantity that can be used within 30 days.
- Do not use gasoline which contains Methanol.
- Do not mix oil with gasoline.
- For engine protection use Briggs & Stratton Gasoline Additive available from your Briggs & Stratton Authorized dealer (P/N 5041 or single use pouch).
- This engine is certified to operate on gasoline. Exhaust Emission Control System: EM (Engine Modifications).

**CAUTION:** Some fuels, called oxygenated or reformulated gasoline, are gasoline blended with alcohols or ethers. Excessive amounts of these blends can damage the fuel system or cause performance problems. If any undesirable operating symptoms occur, use gasoline with a lower percentage of alcohol or ether.

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### HONDA

- **GC160 Engine**

#### REFUELING

Use unleaded gasoline with a pump octane rating of 86 or higher. This engine is certified to operate on unleaded gasoline. Unleaded gasoline produces fewer engine and spark plug deposits and extends exhaust system life.

#### Oxygenated Fuels

Some conventional gasolines are being blended with alcohol or an ether compound. These gasolines are collectively referred to as oxygenated fuels. To meet clean air standards, some areas of the United States and Canada use oxygenated fuels to help reduce emissions.

If you use oxygenated fuel, be sure it is unleaded and meets the minimum octane rating requirements.

Before using an oxygenated fuel, try to confirm the fuel's contents. Some states/provinces

require this information to be posted on the pump.

The following are the EPA approved percentages of oxygenates.

**ETHANOL** -- (ethyl or grain alcohol) 10% by volume.

You may use gasoline containing up to 10% ethanol by volume. Gasoline containing ethanol may be marketed under the name Gasohol.

**MTBE** -- (methyl tertiary butyl ether) 15% by volume.

You may use gasoline containing up to 15% MTBE by volume.

**METHANOL** -- (methyl or wood alcohol) 5% by volume.

You may use gasoline containing up to 5% methanol by volume as long as it also contains cosolvents and corrosion inhibitors to protect the fuel system. Gasoline containing more than 5% methanol by volume may cause starting and/or performance problems. It may also damage metal, rubber, and plastic parts of your fuel system.

If you notice any undesirable operating symptoms, try another service station or switch to another brand of gasoline. Fuel system damage or performance problems resulting from the use of an oxygenated fuel containing more than the percentages of oxygenates mentioned above are not covered under *the Distributor's Limited Warranty*.

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### KOHLER

- **AEGIS**

#### FUEL RECOMMENDATIONS

##### General Recommendations

Purchase gasoline in small quantities and store in clean, approved containers. A container with a capacity of 2 gallons or less with a pouring spout is recommended. Such a

## 2003 Power Equipment Manufacturer Fuel Recommendations

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container is easier to handle and helps eliminate spillage when refueling.

Do not use gasoline left over from the previous season, to minimize gum deposits in fuel system and to ensure easy starting.

Do not add oil to the gasoline. Do not overfill the fuel tank. Leave room for the fuel to expand.

### Fuel Type

For best results, use only clean, fresh, **unleaded** gasoline with the pump sticker octane rating of 87 or higher. In countries using the Research method, it should be 90 octane minimum.

Unleaded gasoline is recommended as it leaves less combustion chamber deposits. Leaded gasoline may be used in areas where unleaded gasoline is not available and exhaust emissions are not regulated. Be aware however, that the cylinder heads may require more frequent service.

### Gasoline/Alcohol Blends

Gasohol (up to 10% ethyl alcohol, 90% unleaded gasoline by volume) is approved as a fuel for Kohler engines. Other gasoline-alcohol blends are not approved.

### Gasoline/Ether Blends

Methyl Tertiary Butyl Ether (MTBE) and unleaded gasoline blends (up to a maximum of 15% MTBE by volume) are approved as a fuel for Kohler engines. Other gasoline/ether blends are not approved.

reducing the build-up of combustion chamber deposits. Leaded gasoline, gasohol containing no more than 10% ethanol, premium gasoline, or unleaded gasoline containing no more than 15% MTBE (Methyl Tertiary Butyl Ether), 15% ETBE (Ethyl Tertiary Butyl Ether) or 10% ethanol can be used if unleaded regular gasoline is not available.

Reformulated gasoline that is now required in several areas of the United States is also acceptable.

**NEVER USE** gasoline, fuel conditioners, additives or stabilizers containing methanol, gasoline containing more than 10% ethanol, unleaded regular gasoline containing more than 15% MTBE (Methyl Tertiary Butyl Ether), 15% ETBE (Ethyl Tertiary Butyl Ether) or 10% ethanol, gasoline additives or white gas, because engine/fuel system damage could result.

**Specialty Fuels:** Fuels being marketed for use on small engines can have a significant effect on starting and engine performance. Prior to using any specialty fuel, the Reid Vapor Pressure (RVP) must be determined.

Fuels with a rating of less than 50kPa (7psi) should not be used in summer, and fuels with a rating of 85kPa (12psi) should not be used during winter.

**Storage:** For year round fuel stability in and out of season, use "Ultra Fresh™" part number 730245A.

### Fuel Additives

Only fuel additives such as Tucemseh's fuel stabilizer Ultra Fresh™ part number 730245A or liquid varieties can be used when mixed properly. For winter applications, isopropyl alcohol fuel dryers may be used in the fuel system but must be mixed at the proper ratio recommended by the manufacturer. **NEVER USE METHANOL BASED DRYERS.**

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## TECUMSEH PRODUCTS COMPANY

### FUEL RECOMMENDATIONS

Today's fuels have a short shelf life and it is recommended that you buy no more than a two week supply at a time.

### Gasoline

Tecumseh Products Company strongly recommends the use of fresh, clean, unleaded regular gasoline in all Tecumseh engines. Unleaded gasoline burns cleaner, extends engine life, and promotes good starting by

## 2003 MARINE MANUFACTURER FUEL RECOMMENDATIONS

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### BOMBARDIER

- *Utopia Sport Boat*

#### RECOMMENDED FUEL

Use regular unleaded gasoline with 87 octane (Ron + Mon)/2 specification.

**NOTE:** This craft features an oil injection system which does not require fuel/oil mixing. Do not mix oil with fuel except at engine break-in. Refer to *MF Jet Drive Operator's Guide*. BREAK-IN PERIOD. Always check oil reservoir level when refueling.

Refer to *MF Jet Drive Operator's Guide* for more detailed information.

**CAUTION:** The use of a fuel other than regular unleaded fuel can result in craft performance deterioration and damage to fuel system and engine components. Never experiment with other fuels or fuel ratios. Never use fuel containing alcohol, methanol or similar products including naphtha.

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### HONDA

- *BF2D Outboard Engine*

#### FUEL RECOMMENDATIONS

**Use unleaded gasoline with a pump octane rating of 86 or higher.**

This outboard motor is certified to operate on unleaded gasoline. Unleaded gasoline produces fewer engine and spark plug deposits and extends exhaust system life.

Never use stale or contaminated gasoline or an oil/gasoline mixture. Avoid getting dirt or water in the fuel tank.

Occasionally you may hear a light "spark knock" or "pinging" (metallic rapping noise)

while operating under heavy loads. This is no cause for concern.

If spark knock or pinging occurs at a steady engine speed, under normal load, change brands of gasoline. If spark knock or pinging persists, see an authorized Honda marine dealer.

#### NOTICE

*Running the engine with persistent spark knock or pinging can cause engine damage.*

Running the engine with persistent spark knock or pinging is misuse and the *Distributor's Limited Warranty* does not cover parts damaged by misuse.

#### Oxygenated Fuels

Some conventional gasolines are being blended with alcohol or an ether compound. These gasolines are collectively referred to as oxygenated fuels. To meet clean air standards, some areas of the United States and Canada use oxygenated fuels to help reduce emissions.

If you use an oxygenated fuel, be sure it is unleaded and meets the minimum octane rating requirement.

Before using an oxygenated fuel, try to confirm the fuel's contents. Some states/provinces require this information to be posted on the pump.

The following are the EPA approved percentages of oxygenates.

**ETHANOL:** ethyl or grain alcohol; 10% by volume

You may use gasoline containing up to 10% ethanol by volume. Gasoline containing ethanol may be marketed under the name "Gasohol".

**MTBE:** Methyl Tertiary Butyl Ether; 15% by volume.

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You may use gasoline containing up to 15% MTBE by volume.

**METHANOL:** methyl or wood alcohol; 5% by volume

You may use gasoline containing up to 5% methanol by volume as long as it also contains cosolvents and corrosion inhibitors to protect the fuel system. Gasoline containing more than 5% methanol by volume may cause starting and/or performance problems. It may also damage metal, rubber, and plastic parts of your fuel system.

If you notice any undesirable operating symptoms, try another service station or switch to another brand of gasoline.

Fuel system damage or performance problems resulting from the use of an oxygenated fuel containing more than the percentages of oxygenates mentioned above are not covered under warranty.

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### INDMAR MARINE

- **Mastercraft Ski Boats\***

#### What Type of Gasoline to Use

All carbureted and standard EFI engines run on unleaded fuel of 89 Octane (R+M)/2 or higher. The LS1 requires 93 octane or higher. Fuels must meet the specification ASTM D4814 in the US and CGSB 3.5-92 in Canada. These fuels need no additives.

<p><b>CAUTION</b> Frequently inspect fuel lines and connections for leaks or deterioration.</p>
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Indmar recommends the regular use of Sta-Bil fuel stabilizer for boat users that consume less than a tank of fuel every two weeks. Today's fuels are more susceptible to degradation and the use of a quality stabilizer will help ensure fewer problems for the occasional boater.

If your boat has not been used for more than 30 days with fuel in the tank (even stabilized fuel), the engine may run poorly until the "old"

fuel is used up. Indmar will not pay for repairs to carburetors or fuel injection components that are inoperable or damaged from old and/or poor quality fuel.

#### Using Oxygenated Fuels or Fuels with Alcohol

MTBE (methyl tertiary butyl ether) is an oxygenate and octane enhancer. This compound may be blended with fuel. Fuel that is no more than 15% MTBE is acceptable for use in your Indmar engine.

Ethyl alcohol, ethanol or grain alcohol is acceptable as long as it is a blend and the blended fuel contains no more than 10% ethanol.

#### CAUTION

<p>Fuels that are blended to contain methanol or wood alcohol should not be used in Indmar engines. These fuels can corrode metal parts in your fuel system and engine. Fuels that contain methanol will damage your engine. Damage caused by the use of fuels that contain methanol is not covered by your warranty.</p>
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#### Fuels in Other Countries

If you operate your Indmar engine outside the USA or Canada, unleaded fuels may be difficult to obtain. Leaded fuels are not recommended as engine components will last longer using unleaded fuel.

***\*[Note: Mastercraft Ski Boats are powered by Indmar inboard marine engines. Indmar marine engines are manufactured by General Motors.]***

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### MERCURY MARINE

- **4-stroke Marine Engine**

#### GASOLINE RECOMMENDATIONS

##### United States and Canada

Use a major brand of automotive unleaded gasoline whenever with a minimum posted octane rating of 87. Mid-grade automotive gasolines that contain fuel injector cleaner are

## 2003 Marine Manufacturer Fuel Recommendations

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preferred for added internal engine cleanliness. Leaded gasoline is not recommended.

### International

Use a major brand of automotive unleaded gasoline whenever with a minimum posted octane rating of 90 RON. Automotive gasolines that contain fuel injector cleaner are preferred for added internal engine cleanliness. Leaded gasoline is acceptable in areas where unleaded gasoline is not available.

### Alcohol in Gasoline

We do not recommend the use of gasoline which contains alcohol because of the possible adverse effect the alcohol may have on the fuel system. In general,

Gasoline containing alcohol may cause the following problems to your outboard and fuel system:

- Corrosion of metal parts.
- Deterioration of elastomers and plastic parts.
- Wear and damage of internal engine parts.
- Starting and operating difficulties.
- Vapor lock or fuel starvation.

Some of these adverse effects are due to the tendency of gasoline containing alcohol to absorb moisture from the air, resulting in a phase of water and alcohol which separates from the gasoline in the fuel tank.

The adverse effects of alcohol are more severe with methanol and are worse with increasing content of alcohol.

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## NISSAN

- **4-stroke NSF Outboard Engine**

### REQUIRED GASOLINE TYPES

Unleaded, minimum pump posted 87 octane gasoline is recommended.

(Octane is based on posted rating.)

(91 based on research octane rating method)

#### Note:

Use of low quality gasoline results in a short engine life as well as starting difficulties and other engine problems.

#### Note:

(1) Gasoline containing alcohol, methanol (methyl), or ethanol (ethyl), may cause:

- Wear and damage to bearings, cams, piston(s), piston rings.
- Corrosion of metal parts.
- Deterioration of rubber and plastic parts.
- Starting, idling, and other engine performance problems.

(2) Do not use gasoline that contains more than 10% ethanol or more than 5% methanol.

(3) Damage resulting from the use of gasolines that contain alcohol are not covered under the limited warranty

- **2-stroke NS Outboard Engine**

### REQUIRED GASOLINE TYPES

Unleaded gasoline is recommended for outboard motors.

The minimum octane rating should be 87 based on the pump posted octane rating method (91 based on research octane rating method).

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## OUTBOARD MARINE

- **Evinrude, Johnson Outboard Engines**

### FUEL

Your outboard is certified to operate on unleaded automotive gasoline with an octane rating equal to or higher than that specified in **Minimum Octane** chart. When using gasoline that contains MTBE or alcohol, follow these guidelines.

Using unleaded gasoline that contains methyl tertiary butyl ether (MTBE) is acceptable **ONLY** if the MTBE content does not exceed 15% by volume.



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Using alcohol-extended fuels is acceptable **ONLY** if the alcohol content does not exceed:

- **10% ethanol by volume.**
- **5% methanol with 5% cosolvents by volume.**

### Minimum Octane

Inside the U.S.....	87 (R+M)/2 AKI
Outside the U.S.....	90 RON

OMC products have been designed to operate using the above fuel; however, be aware of the following:

- The boat's fuel system may have different requirements regarding the use of alcohol fuels. Refer to the boat's owner manual.
- Alcohol attracts and holds moisture that can cause corrosion of metallic parts in the fuel system.
- Alcohol blended fuel can cause engine performance problems.
- All parts in the fuel system should be inspected frequently and replaced if signs of deterioration or leakage are found. Inspect at least annually.

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## PLEASURECRAFT ENGINE GROUP

- **PCM Marine Engines**

### GASOLINE REQUIREMENTS

**Warranty Notice:** Damage caused to the engine through the use of improper gasoline, low-quality or gasoline with an octane rating below the minimum requirements listed below, is considered misuse of the engine. Such damage is not covered by the PCM Engines warranty.

The ignition timing set by the factory requires the use of a high-quality lead-free regular gasoline with the following octane specification.

Pump Octane Number (R+M/2) (PUMP) - 87

**Notice:** Most PCM Fuel Injected engines are calibrated to operate on 87 octane fuel and maximum performance is obtained; costs, can cause temporary performance loss. Therefore, the use of these fuels is not recommended.

Some applications may require a higher octane fuel. These particular applications will be noted.

If a slight pinging is heard during acceleration and the proper octane fuel is being used, it is considered normal. If a constant, heavy knock occurs, the engine should be evaluated by a PCM Engine service technician.

### Gasoline Containing Alcohol

Gasoline containing alcohol, either ethanol (ethyl alcohol) or methanol (methyl alcohol) is not recommended for use in your engine. Gasoline containing alcohol will attract and hold moisture and may cause the following:

- Hard starting and operating difficulties (vapor lock, low speed stalling)
- Corrosion of metal parts
- Excessive wear and damage to internal engine parts
- Fuel permeation through flexible fuel lines
- Deterioration of some nonmetallic materials

The adverse effects of alcohol are more severe with methanol and are worse with increasing alcohol content.

If gasoline containing alcohol is used, or if the presence of alcohol is uncertain, more frequent inspections of the complete fuel system are required. Any sign of fuel leakage or deterioration must be repaired immediately before further engine operation.

**Notice:** Some gasolines contain an octane-enhancing additive called methylcyclopentadienyl manganese tricarbonyl (MMT), and they should not be used. These fuels may reduce spark plug life, and engine performance may be affected.

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## SUZUKI

- **DF60, DF70 Outboard Motor**

### FUEL AND OIL

#### Gasoline

Suzuki highly recommends that you use alcohol-free unleaded gasoline whenever



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possible, with a minimum pump octane rating of 87 ((R+M)/2 method). In some areas, the only fuels that are available are oxygenated fuels. Oxygenated fuels which meet the minimum octane rating requirement and the requirements described below may be used in your outboard motor without jeopardizing the New Outboard Motor Limited Warranty.

### CAUTION

**If leaded gasoline is used, engine damage may result. Use only unleaded gasoline. Do not use fuel of a lower than recommended octane or fuel that may be stale or contaminated by dirt/water etc. Such poor quality fuel will affect performance and may damage your engine and fuel system.**

*NOTE: Oxygenated fuels are fuels which contain oxygen-carrying additives such as MTBE or alcohol.*

### Gasoline containing MTBE

Unleaded gasoline containing MTBE. (Methyl Tertiary Butyl Ether) may be used in your outboard motor if the MTBE content is not greater than 15%. This oxygenated fuel does not contain alcohol.

### Gasoline/Ethanol Blends

Blends of unleaded gasoline and ethanol (grain alcohol), also known as GASOHOL, may be used in your outboard motor if the ethanol content is not greater than 10%.

### Gasoline/Methanol Blends

Avoid using blends of unleaded gasoline and methanol (wood alcohol) whenever possible. DO NOT USE fuels containing more than 5% methanol under any circumstances. Fuel system damage or outboard motor performance problems resulting from the use of such fuels are not the responsibility of Suzuki and may not be covered under the New Outboard Motor Limited Warranty.

Fuel containing 5% or less methanol (wood alcohol) may be suitable for use in your outboard motor if they contain cosolvents and corrosion inhibitors.

### Fuel Pump Labeling

In some states, pumps that dispense oxygenated fuels are required to be labeled for

the type and percentage of oxygen, and whether important additives are present. Such labels may provide enough information for you to determine if a particular blend of fuel meets the requirements listed above. In other states, pumps may not be clearly labeled as to the content or type of oxygen and additives. If you are not sure that the fuel you intend to use meets these requirements, check with the service station operator or the fuel suppliers.

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## YAMAHA

### • VZ150 Outboard Engine

### CAUTION

- **Use only new clean gasoline which has been stored in clean containers and is not contaminated with water or foreign matter.**
- **Do not use leaded gasoline (petrol). Leaded gasoline will cause damage to the oxygen sensor for Electronic Fuel Injection System.**

### Gasoline (Petrol)

Recommended gasoline:

Regular unleaded gasoline with a minimum octane rating of 86 (Pump Octane Number = (R+M)/2)

### Gasohol

There are two types of gasohol: gasohol containing ethanol and that containing methanol. Gasohol containing ethanol can be used if ethanol content does not exceed 10% and the fuel meets minimum octane ratings. Gasohol containing methanol is not recommended by Yamaha because it can cause fuel system damage or engine performance problems.